



Docket No.: E0295.70197US00
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Michael Kilian et al.
Serial No.: 10/731603
Confirmation No.: 4744
Filed: December 9, 2003
For: METHODS AND APPARATUS FOR PARSING A CONTENT
ADDRESS TO FACILITATE SELECTION OF A PHYSICAL
STORAGE LOCATION IN A DATA STORAGE SYSTEM
Examiner: Not Yet Assigned
Art Unit: N/A

Certificate of Mailing Under 37 CFR 1.8(a)

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the U.S. Postal Service on the date shown below with sufficient postage as First Class Mail, in an envelope addressed to: Mail Stop Issue Fee, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Dated: August 15, 2006

Eileen MacKenzie
Eileen MacKenzie

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE

Mail Stop Issue Fee
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The Notice of Allowance and Fee(s) Due mailed July 12, 2006 included an Examiner's Amendment and an Examiner's Statement of Reasons for Allowance.

Initially, Applicants note that several of the claims amended in the Examiner's Amendment are listed with the heading "Original" rather than identified as being "Amended." Applicants further note that the claims are similar in many respects to proposed claims e-mailed to the Examiner on June 26, 2006. That e-mail and the proposed claims are attached for the record.

There are six independent claims allowed. Understandably, in the Statement of Reasons for Allowance, the Examiner did not separately address each independent claim, but indicated that they "teach the same concepts" so that he only discussed in detail claim 1 and indicated that

the explanation thereof applies to the other independent claims. Applicants understand that each of the claims is patentable based solely upon the language included therein and that the Examiner's shorthand reference to the claims teaching "the same concepts" is not intended to incorporate any limitation from one of the claims into another where it is not present. If the Examiner disagrees, he is respectfully requested to contact the undersigned at the number listed below to discuss how the record can be clarified.

In addition, the Reasons for Allowance indicates that the independent claims are of similar scope but directed to different types of claims (i.e., method, computer readable medium and apparatus). While this is true with respect to some of the claims, it is not true for all. In this respect, claims 1, 11 and 21 are generally directed to a similar concept, although they obviously are of different scope, and the same can be said for claims 31, 35 and 39. These two groups of claims are not directed to similar concepts and must be evaluated independently.

Applicants also would like to address some of the specific statements about claim 1. First, the Reasons for Allowance states that the host is able to access data in a content addressable storage system based on "the actual contents of the data units." It is believed that the Examiner means by this that the host accesses data units using content addresses generated based on the content of the data units. Second, the Reasons for Allowance indicates that the novelty results from the content address including a plurality of bits and "the fact that the actual contents of the data units are being accessed." Applicants would like to emphasize that claim 1 refers to the parsing of the bits of the content address to determine at least one aspect of the physical storage location for the unit of data, and does not recite parsing the content unit itself. Third, the Reasons for Allowance states that "parsing the bits of a content addressable storage remains a novel notion." Again, Applicants would like to emphasize that it is the bits of a content address that are recited as being parsed in claim 1. Finally, Applicants would like to emphasize that claim 1 is patentable over the prior art of record based on the subject matter recited therein as a whole, as opposed to any particular novel limitation(s).

Applicants would like to further point out that while independent claims 11 and 21 also recite the parsing of the content address to determine at least one aspect of the physical storage location, claims 31, 35 and 39 include no such limitation. These claims distinguish over the prior art of record solely based upon the language in those claims.

If the Examiner disagrees with any of the foregoing, he is respectfully requested to contact the undersigned at the number listed below so that a discussion can be had about clarifying the record as to the reasons for allowance.

Dated: August 15, 2006

Respectfully submitted,

Michael Kilian et al., Applicants

By 

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Giunta, Rich

From: Giunta, Rich
Sent: Monday, June 26, 2006 7:05 PM
To: 'Lev.Iwashko@uspto.gov'
Subject: Proposed Claim Amendments - 10/731,603 (E0295.70197US00)
Attachments: Propose Amendment.DOC

Examiner Iwashko,

Here are proposed amendments for the above-referenced application. Independent claims 1, 11 and 21 are amended to incorporate the limitations of claims 2, 12 and 22, respectively.

Please let me know if you have any questions. I assume you will make this email part of the record.

Thanks,
Rich

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10/731,603 Proposed Amendments (6/26/06)

1. (Amended) A method of processing data in a computer system comprising at least one host and at least one content addressable storage system which stores data for the at least one host, wherein the at least one host accesses data units stored on the at least one storage system using content addresses generated based on the content of the data units, the method comprising an act of:

(a) in response to an access request from the at least one host computer for a unit of data identified by a content address, parsing the content address to determine at least one aspect of a physical storage location for the unit of data on the at least one storage system;

wherein the at least one storage system includes a plurality of storage nodes, and wherein the act (a) further comprises an act of parsing the content address to determine which of the plurality of storage nodes includes the physical storage location for the unit of data.

2. (Cancelled).

3. (Amended) The method of claim [2] 3, wherein at least some of the plurality of storage nodes include a plurality of disks, and wherein the act (a) further comprises an act of parsing the content address to determine which of the plurality of disks includes the physical storage location for the unit of data.

4. (Original) The method of claim 1, wherein the act (a) is performed in response to a request to retrieve the unit of data from the at least one storage system, and wherein the method further comprises an act of passing the unit of data to the at least one host.

5. (Original) The method of claim 1, wherein the act (a) is performed in response to a request to write the unit of data to the at least one storage system.

6. (Original) The method of claim 5, further comprising an act of storing the unit of data at least partially at the physical storage location.

7. (Original) The method of claim 5, further comprising acts of:
 - applying an algorithm to determine a specified physical storage location based on the content address;
 - determining whether the specified physical storage location is suitable to store the unit of data, and when it is not, performing acts of:
 - storing the unit of data at a different physical storage location; and
 - storing a pointer to the different physical storage location at the specified physical storage location.
8. (Original) The method of claim 7, further comprising acts of:
 - moving the unit of data from the different physical storage location to the specified storage location; and
 - deleting the pointer to the different physical storage location.
9. (Original) The method of claim 1, wherein the storage system comprises a plurality of storage nodes, and wherein the method further comprises an act of assigning, to at least one of the plurality of storage nodes, a range of content addresses so that the at least one of the plurality of storage nodes is assigned to store a plurality of units of data having content address within the range of content addresses.
10. (Original) The method of claim 1, further comprising an act of determining the physical storage location of the unit of data solely by the act of parsing and without performing an index lookup.
11. (Amended) At least one computer readable medium encoded with instructions that, when executed on a computer system perform, a method of processing data, wherein the computer system comprises at least one host and at least one content addressable storage system which stores data for the at least one host, and wherein the at least one host accesses data units stored

on the at least one storage system using content addresses generated based on the content of the data units, the method comprising an act of:

(a) in response to an access request from the at least one host computer for a unit of data identified by a content address, parsing the content address to determine at least one aspect of a physical storage location for the unit of data on the at least one storage system;

wherein the at least one storage system includes a plurality of storage nodes, and wherein the act (a) further comprises an act of parsing the content address to determine which of the plurality of storage nodes includes the physical storage location for the unit of data.

12. (Cancelled).

13. (Amended) The at least one computer readable medium of claim [12] 11, wherein at least some of the plurality of storage nodes include a plurality of disks, and wherein the act (a) further comprises an act of parsing the content address to determine which of the plurality of disks includes the physical storage location for the unit of data.

14. (Original) The at least one computer readable medium of claim 11, wherein the act (a) is performed in response to a request to retrieve the unit of data from the at least one storage system, and wherein the method further comprises an act of passing the unit of data to the at least one host.

15. (Original) The at least one computer readable medium of claim 11, wherein the act (a) is performed in response to a request to write the unit of data to the at least one storage system.

16. (Original) The at least one computer readable medium of claim 15, wherein the method further comprises an act of storing the unit of data at least partially at the physical storage location.

17. (Original) The at least one computer readable medium of claim 15, wherein the method further comprises acts of:

applying an algorithm to determine a specified physical storage location based on the content address;

determining whether the specified physical storage location is suitable to store the unit of data, and when it is not, performing acts of:

storing the unit of data at a different physical storage location; and

storing a pointer to the different physical storage location at the specified physical storage location.

18. (Original) The at least one computer readable medium of claim 17, wherein the method further comprises acts of:

moving the unit of data from the different physical storage location to the specified storage location; and

deleting the pointer to the different physical storage location.

19. (Original) The at least one computer readable medium of claim 11, wherein the storage system comprises a plurality of storage nodes, and wherein the method further comprises an act of assigning, to at least one of the plurality of storage nodes, a range of content addresses so that the at least one of the plurality of storage nodes is assigned to store a plurality of units of data having content address within the range of content addresses.

20. (Original) The at least one computer readable medium of claim 11, wherein the method further comprises an act of determining the physical storage location of the unit of data solely by the act of parsing and without performing an index lookup.

21. (Amended) A content addressable storage system for use in a computer system, including the content addressable storage system and at least one host, wherein the at least one host accesses data units stored on the content addressable storage system using content addresses generated based on the content of the data units, the content addressable storage system comprising:

at least one storage device to store data received from the at least one host; [and]

at least one controller that, in response to an access request from the at least one host computer for a unit of data identified by a content address, parses the content address to determine at least one aspect of a physical storage location for the unit of data on the at least one storage system; and

a plurality of storage nodes that comprise the at least one storage device;

wherein the at least one controller parses the content address to determine which of the plurality of storage nodes includes the physical storage location for the unit of data

22. (Cancelled).

23. (Amended) The content addressable storage system of claim [22] 21, wherein at least some of the plurality of storage nodes include a plurality of disks, and wherein the at least one controller parses the content address to determine which of the plurality of disks includes the physical storage location for the unit of data.

24. (Original) The content addressable storage system of claim 21, wherein the at least one controller parses the content address in response to a request to retrieve the unit of data from the at least one storage system, and wherein the controller passes the unit of data to the at least one host.

25. (Original) The content addressable storage system of claim 21, wherein the at least one controller parses the content address in response to a request to write the unit of data to the at least one storage system.

26. (Original) The content addressable storage system of claim 25, wherein the at least one controller stores the unit of data at the physical storage location.

27. (Original) The content addressable storage system of claim 25, wherein the at least one controller:

applies an algorithm to determine a specified physical storage location based on the content address;

determines whether the specified physical storage location is suitable to store the unit of data, and when it is not:

stores the unit of data at a different physical storage location; and

stores a pointer to the different physical storage location at the specified physical storage location.

28. (Original) The content addressable storage system of claim 27, wherein the at least one controller:

moves the unit of data from the different physical storage location to the specified storage location; and

deletes the pointer to the different physical storage location.

29. (Original) The content addressable storage system of claim 21, further comprising a plurality of storage nodes that comprise the at least one storage device, wherein the controller assigns, to at least one of the plurality of storage nodes, a range of content addresses so that the at least one of the plurality of storage nodes is assigned to store a plurality of units of data having content address within the range of content addresses.

30. (Original) The content addressable storage system of claim 21, wherein the controller determines the physical storage location of the unit of data solely by parsing the content address and without performing an index lookup.

31. (Original) A method of processing data in a computer system comprising at least one host and at least one content addressable storage system which stores data for the at least one host, wherein the at least one host accesses data units stored on the at least one storage system using content addresses generated based on the content of the data units, the method comprising acts of:

(a) receiving, from the host, a request to store a unit of data on the storage system, the unit of data having a content address based on the content of the unit of data;

(b) determining, based on the content address, a first storage location on the storage system to which the content address maps;

(c) storing a pointer for the first unit of data at the first storage location, the pointer pointing to a second storage location; and

(d) storing the unit of data at the second storage location on the storage system.

32. (Original) The method of claim 31, wherein the act (d) is performed before the acts (b) and (c).

33. (Original) The method of claim 31, further comprising acts of:

(e) receiving, from the host, a request to retrieve the unit of data, the request including a content address of the unit of data;

(f) mapping the content address to the first storage location;

(g) retrieving the pointer from the first storage location; and

(h) using the pointer to access the second storage location and retrieve the unit of data from the second storage location.

34. (Original) The method of claim 31, further comprising acts of:

(i) periodically searching the at least one storage system for pointers to other storage locations on the storage system which store units of data; and

(j) determining whether any of the pointers to other storage locations can be replaced with their corresponding units of data.

35. (Original) At least one computer readable medium encoded with instructions that, when executed on a computer system, perform a method of processing data, wherein the computer system comprises at least one host and at least one content addressable storage system which stores data for the at least one host, and wherein the at least one host accesses data units stored

on the at least one storage system using content addresses generated based on the content of the data units, the method comprising acts of:

- (a) receiving, from the host, a request to store a unit of data on the storage system, the unit of data having a content address based on the content of the unit of data;
- (b) determining, based on the content address, a first storage location on the storage system to which the content address maps;
- (c) storing a pointer for the first unit of data at the first storage location, the pointer pointing to a second storage location; and
- (d) storing the unit of data at the second storage location on the storage system.

36. (Original) The at least one computer readable medium of claim 35, wherein the act (d) is performed before the acts (b) and (c).

37. (Original) The at least one computer readable medium of claim 35, wherein the method further comprises acts of:

- (e) receiving, from the host, a request to retrieve the unit of data, the request including a content address of the unit of data;
- (f) mapping the content address to the first storage location;
- (g) retrieving the pointer from the first storage location; and
- (h) using the pointer to access the second storage location and retrieve the unit of data from the second storage location.

38. (Original) The at least one computer readable medium of claim 35, wherein the method further comprises acts of:

- (i) periodically searching the at least one storage system for pointers to other storage locations on the storage system which store units of data; and
- (j) determining whether any of the pointers to other storage locations can be replaced with their corresponding units of data.

39. (Original) A content addressable storage system for use in a computer system that includes at least one host, wherein the at least one host accesses data units stored on the content addressable storage system using content addresses generated based on the content of the data units, the content addressable storage system comprising:

at least one storage device to store data received from the at least one host; and
at least one controller that:

receives, from the host, a request to store a unit of data on the storage system, the unit of data having a content address based on the content of the unit of data;

determines, based on the content address, a first storage location on the storage system to which the content address maps;

stores a pointer for the first unit of data at the first storage location, the pointer pointing to a second storage location; and

stores the unit of data at the second storage location on the storage system.

40. (Original) The content addressable storage system of claim 39, wherein the controller stores the unit of data at the second storage location on the storage system before determining the first storage location and storing the pointer.

41. (Original) The content addressable storage system of claim 39, wherein the controller further:

receives, from the host, a request to retrieve the unit of data, the request including a content address of the unit of data;

maps the content address to the first storage location;

retrieves the pointer from the first storage location; and

uses the pointer to access the second storage location and retrieve the unit of data from the second storage location.

42. (Original) The content addressable storage system of claim 39, wherein the controller is adapted to:

periodically search the at least one storage system for pointers to other storage locations on the storage system which store units of data; and

determine whether any of the pointers to other storage locations can be replaced with their corresponding units of data.



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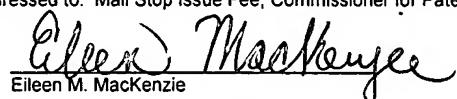
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Examiner: L. Iwashko
Art Unit: 2186

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Dated: August 15, 2006


Eileen M. MacKenzie

Mail Stop Issue Fee
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Transmitted herewith are the following documents:

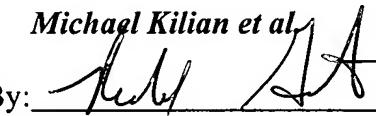
- Part B — Issue Fee Transmittal
- Comments on Statement of Reasons for Allowance
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If the enclosed papers are considered incomplete, the Mail Room and/or the Application Branch is respectfully requested to contact the undersigned at (617) 646-8000, Boston, Massachusetts.

A check in the amount of \$1,715.00 is enclosed to cover the issue fee, publication fee, and patent copies. If the fee is insufficient, the balance may be charged to Deposit Account 23/2825.

Dated: August 15, 2006

Respectfully submitted,

By: 

Richard F. Giunta

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